

Back to the future – using a pen in STEM e-exams

E-A×M+S 2020
22nd June to 1st July

Mathew Hillier – now at Macquarie University, Sydney, Australia



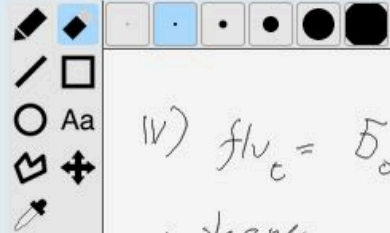
Question 10

Not yet answered

Marked out of 1.00

Flag question

Show any mathematical working out below.



Quick context

- UNSW – top 100 research intensive, 59,000 students and 7,000 staff.
- New online Master of Data Science unit final exams – approx 150 students across two cohorts.
- This presentation focused on digital inking in remote invigilated exam in STEM.

Digital Inking for e-Exams : Pilot in 2019

Moodle free hand drawing (Poodll) installed 8 Aug – 1st pilot 15 Oct remote online exam

Annotate an image, free hand drawing, writing formulae, drawing diagrams – in Moodle.

Commodity \$60 USB graphics tablet (needs some practice) or touch screen device.

Question 4
Not yet answered
Marked out of 1.00
Flag question

Annotate the plan below. Circle the master bedroom.

Note: when using a large background image - it is best to resize the image to fit within the canvas width and height. Otherwise the image is cropped from the viewport when first displayed. However the user can use zoom out can be used to see it all.




stroke
fill
bg
Clear

Uploaded successfully

Save Picture

Question 10
Not yet answered
Marked out of 1.00
Flag question

Show any mathematical working out below.



stroke
fill
bg
Clear

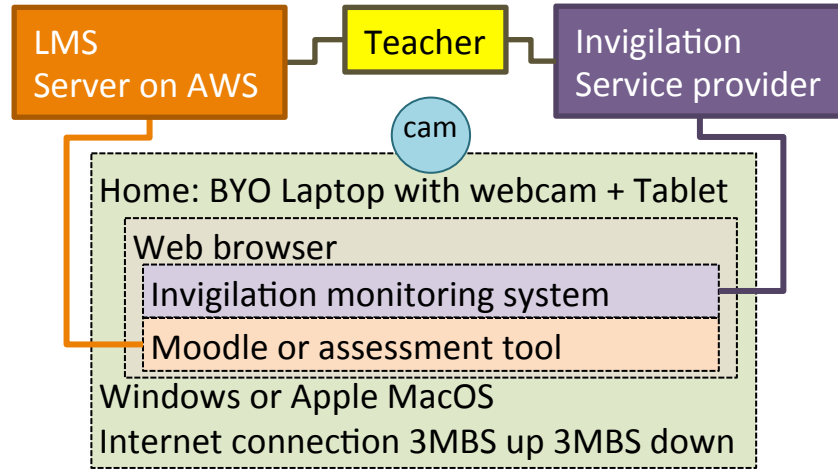
Uploaded successfully



In future ... images could be transferred to artificial intelligence marking tool? (e.g. work of Dr. D. Kellerman, UNSW)

Procedure used: Off-campus Invigilated Digital Exams

Off-campus invigilated exams architecture



Equipment at home: BYO laptop with webcam. Standard web browser with connections to invigilation service provider and exam materials in Moodle.
Digital inking add-on: USB graphics tablet (digital pen) for digital ink input.

Steps:

- 1. Well before the exam:**
 - **Academic prepares exam:** Set up exam in Moodle. Set up exam rules. Schedule in invigilation service.
 - **Student pre-registers** at the invigilation service (create account, set time zone, set up ID).
- 2. Before the exam:** Student books exam time with invigilation service and does technology checks.
- 3. Exam time:** Student login to Moodle. Clicks link to exam. Lands at invigilation provider. Does technology check, pre-id checks, room scan. Invigilator does system checks. Clicks start exam. Is taken to Moodle (or other tool). Does exam while monitored by invigilation service. Follow exit steps when done (submit file, clear cache etc).
- 4. After Exam:** Exam available for marking in Moodle and recording reviewed/flagged by invigilator. Video viewable by teacher.

Remote exam monitoring and recording

Exam

A screenshot of a UNSW LMS course page. The page shows a course outline with a sidebar on the left containing navigation links like 'Course outline', 'Feedback', and 'Assessments'. The main content area displays a document titled 'Exam' with a blurred image of a diagram or flowchart. The UNSW logo is visible in the top left corner.

Student

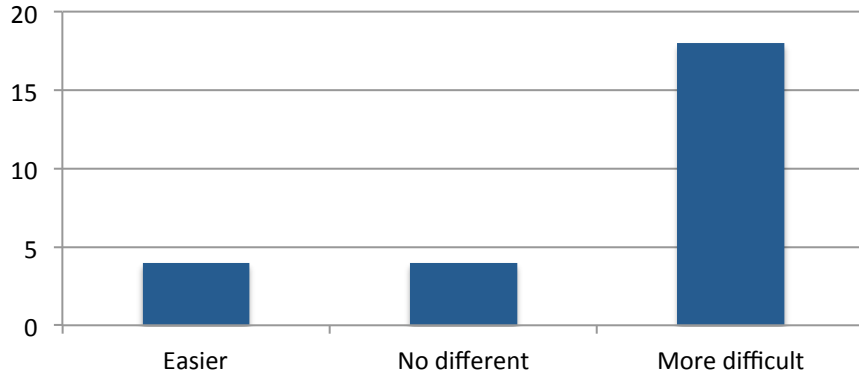
A video call interface showing a student's face. A large, yellow smiley face with two dots for eyes and a curved line for a mouth is overlaid on the student's face, completely obscuring it. The video call window includes a toolbar at the top with icons for mute, video, chat, and other functions.



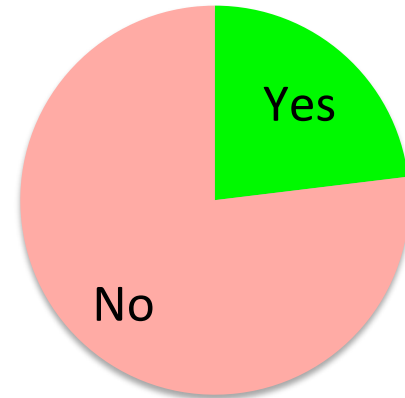
Remote exam – student feedback

Feedback following two remote online exams (responses = 26 ~ low response):
Students did not have a good time... Why?

Onsite v remote: I think this exam
was practically...



- a) Drawing tool was clunky.
- b) Vendor staff unfamiliar/unhelpful.
- c) *Problem with internet during exam:*



But - Many didn't engage with ***practice*** opportunities as was instructed.



Pilot findings

Successful as a ‘minimum viable product’. It worked largely as expected on a technical level given the known caveats and context.

25% negative feedback from the cohort – but low response rate.

Issues partly due to:

- Students not reading the instructions that contained the known issues on usability and min technical requirements (provided well in advance).
- Not doing the recommended/meaningful practice as advised (i.e. practice required to become proficient in use).
- Clunky drawing tool.
- However the remote exam context also added layers of complexity.



Contextual factors

A first run - early days, so feedback reflects this.

Difficult and complex confounding factors: i.e, course design did not include scaffold inking practice and this was not able to be addressed, minimal/optional opportunity for students to practice and they didn't, students didn't read instructions that included usability caveats, remote proctors unfamiliar with system despite the provider being briefed, could not use surface pros due to web cam angle requirement.

Problematic data collection: Feedback could only be collected late, it was online only and it was optional (due to upstream decree) – thus hard to discern true picture of attitude/usability.



Future actions needed

- a) **Refine/fix the drawing tool** to address usability caveats – e.g. fix text tool, remove the ‘move’ tool, better autosave, copy/paste drawing elements. Will require some funding to address (although minor in the scheme of things!).
- b) **Refine user documentation**, add videos of use etc.
- c) **Practice and instructions to be built-into the course itself** – i.e. scaffold use of the graphics tablet for formative/lower stakes learning tasks during the term before students get to the exam.
- d) **Run an inking pilot using on-campus lab machines** to minimise confounding factors and move forward from that (that includes the other points!). i.e follow procedures used in DET e-exam grant pilots.
- e) Revisit the remote proctoring use case later!



e-Exams: What works and what doesn't

- Digital inking = must get students to practice multiple times -> ensure course design has scaffolded use in formative/low stakes *before* the exam. It can work!
- Remote proctoring vendors ~ don't ask, don't tell. -> Needs simultaneous sitting capacity. Careful about logistics models used by vendor. Students must practice.
- Delivery...
 - PC labs + SEB + Moodle = works! (needs generic login)
 - BYOD + SEB in windows = security fail! (Try Alt boot methods)

Get in touch!

Dr Mathew Hillier

Now at Macquarie University, Sydney, Australia

Mathew.Hillier@gmail.com

<http://mathewhillier.com>



Other Info (not inking):

DET national e-Exam project <http://TransformingExams.com>

Cite this: Hillier, M (2020) “Back to the future - using a pen in STEM e-exams”, e-Assessment in mathematics and science conference (online), Newcastle University, Presentation 22nd June.

Conference site: <https://eams.ncl.ac.uk/>